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HYDRO-ELECTRIC POWER
in the
NIAGARA DISTRICT
PROVINCE *of* ONTARIO
CANADA



HYDRO-ELECTRIC POWER COMMISSION *of* ONTARIO

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in the
NIAGARA DISTRICT
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CANADA

COMMISSIONERS

COL. SIR ADAM BECK, K.T., LL.D.

HON. I. B. LUCAS

LT.-COL. HON. D. CARMICHAEL, D.S.O., M.C.

HYDRO-ELECTRIC POWER COMMISSION *of* ONTARIO



Introductory



ORE than twenty years ago, at the time when the art of generating and transmitting electrical energy was just beginning to make rapid strides, the people of the Province of Ontario realizing that they were handicapped in having no coal supply for the operation of their industries, naturally began to look to the water power of Niagara Falls and other water powers to supply the power which they required.

After much preliminary investigation, in 1907 the Provincial Government passed an Act, known as the "Power Commission Act," under which the municipalities of the province were authorized to enter into the business of generating, transmitting and distributing electrical power; this work to be carried on under the supervision of a commission known as the Hydro-Electric Power Commission of Ontario, which acts as trustee for the municipalities in connection with the operation of this partnership scheme. Under this Act, each municipality is to be supplied with power at cost, each municipality entering into a contract with the Commission to pay a proportionate part of all interest charges, sinking fund charges, maintenance, operation and renewals on the expenditure necessary to generate, transmit and deliver the power required, the whole being adjusted so as to insure the discharge of the entire indebtedness in thirty years.

Electricity is essential to our modern existence.

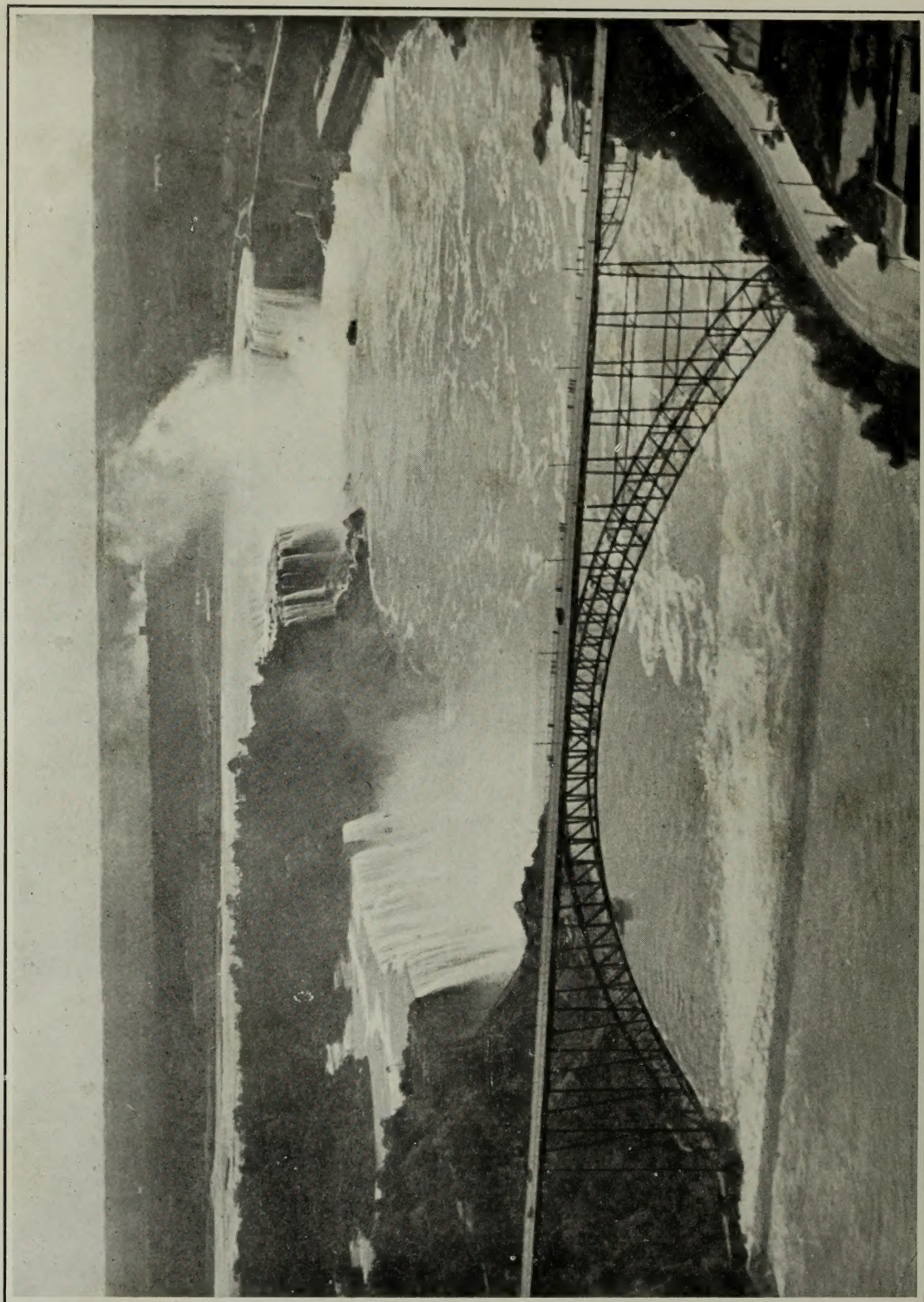
Without it we should be back in the Middle Ages, candles and torches for lighting; hand labor for all purposes; land transportation restricted to that provided by human and animal agencies and water transportation to small sailing ships dependent upon the vagaries of the wind; communication limited to the slow means of locomotion at the disposal of the courier, in the absence of anything faster than horses; these would form some of the conditions under which we should live.

Within the last two hundred years scientific discoveries have given to the world the power inherent in fuels, viz.: coal, gas and oil, and in falling water, in the varied forms of heat, light, chemical action, mechanical power and electricity.

It has been estimated that the total water powers of the world available for use amount to approximately 100,000,000 horsepower, of which only about 17,000,000 has so far been developed.

The Dominion of Canada possesses approximately 20 per cent. of the world's total water power, and also possesses approximately the same percentage of the world's water powers already developed. The people of the Province of Ontario are particularly concerned in the development of water power for two outstanding reasons:

(1) There is no coal within the Province and the manufacturers must depend upon the importation of coal from the Far East or from the Far



Niagara Falls, viewed from the Air.

West of the Dominion, or receive their coal supply from the United States.

(2) The Province contains an abundant supply of water power, aggregating in all 6,000,000 horsepower, of which approximately 800,000 horsepower has already been developed.

The first of these resources to be utilized by man was coal, but although this fuel is very widely distributed, and exists in immense quantities in various parts of the earth, there is no denying the fact that the supply will some day come to an end.

The supplies of oil and gas, like those of coal,

THE HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO

In 1907 the Provincial Legislature passed an Act known as the Power Commission Act, authorizing one or more municipalities in the Province, individually and jointly, through a Commission or corporate body, to generate, transmit and distribute power. Under this legislation it was arranged that the cost of such work should be financed by loans of the Provincial Government, the loans to be secured by a lien on the property of the munici-



An Ontario Farm supplied with Light and Power by the Hydro-Electric Power Commission of Ontario

are limited in quantity, and if used in too prodigal a fashion will be exhausted all too soon.

Our remaining important source of energy, water power, differs from the fuels in one important respect, in that there is no need to fear that continued use will reduce the supply available for future generations; hence, one of the best means of conserving the fuel supplies is to substitute the use of water power wherever this is practicable. This is what the municipalities of Ontario have done for themselves in a very eminent degree, with extremely satisfactory results.

palities entering into the partnership scheme, due provision being made to return these loans at the end of thirty years. This action on the part of the Provincial Legislature was taken as the result of a favorable report submitted to the Legislature by the "Ontario Power Commission," appointed at an earlier date by the Provincial Government to investigate the proposition of purchasing, generating and transmitting power from Niagara Falls to the municipalities in southwestern Ontario.

The Hydro-Electric Power Commission of Ontario is appointed by the Provincial Government

to act as trustee and administrator for the municipalities which have signed contracts with the Commission for their power supply and become partners in the co-operative municipal scheme by which each municipality receives power *at cost*.

A PARTNERSHIP OF MUNICIPALITIES

Each municipality having a contract with the Commission pays in its power bill not only the cost of power generated at the source of supply, but also a proportionate part of all interest charges, sinking fund charges, maintenance, renewals, and all other charges applicable to any business, on the expenditure necessary to transform and transmit the power purchased or generated, from the source of supply to the point at which the power is used, the whole cost being adjusted so as to ensure the discharge of the entire indebtedness in thirty years.

EXPANSION OF COMMISSION'S WORK

Since its formation the growth of the Commission's activities has been enormous and from one system supplying approximately 4,000 horsepower to 12 municipalities in 1911, the work of the Commission has expanded so rapidly that at the present time the Commission has constructed, and is supplying power to, 14 different systems embracing over 275 municipalities to which are supplied approximately 340,000 horsepower distributed over an area nearly as large as that of England.

The following is a list of the Systems now being supplied by the Commission:

System	Approximate Present Load in Horsepower
Niagara	275,000
Severn	6,500
Eugenia	3,220
Wasdell's	400
St. Lawrence	2,000
Muskoka	1,500
Nipissing	1,300
Rideau	1,350
Ottawa	7,500
Central Ontario	33,000
Port Arthur	5,400
Total.....	337,170 h.p.

Not only does the Commission supply power to urban municipalities but electric energy is now being furnished to over 500 farms located in various parts of the Province and to approximately 5,000 other rural consumers, and at the Commission's request the Provincial Government has recently passed legislation which will enable the Commission to proceed with a large, comprehensive scheme to supply power to every rural district in Ontario.

At the urgent request of municipalities throughout the Province, the Provincial Government passed an Act by which the Commission may purchase, construct and operate electric radial railways on behalf of the municipalities in a manner somewhat similar to that under which electric power is now supplied, and the Commission is now operating several electric railways and is negotiating for the purchase and construction of others.

NIAGARA DISTRICT

The term "Niagara District" includes the southwestern part of the Province of Ontario lying south of a line drawn between the town of Oshawa on Lake Ontario and the town of Goderich on Lake Huron; the area of this territory is about 11,950 square miles.

Already the Commission has expended on behalf of the municipalities in this district approximately \$15,000,000.00, and the municipalities themselves have spent approximately \$22,500,000.00, in the construction of their own distribution systems.

Municipalities having contracts with the Commission receive power from the Commission *at cost* and the municipalities own and operate their own systems to distribute the power so supplied to power and lighting customers. The rates at which this power and light are supplied are, according to the "Power Commission Act," fixed by the Commission—these rates being adjusted annually to a cost basis, so that while each municipality owns and operates its own distribution system, it does so under the supervision and direction of the Commission.

The success of this co-operative scheme to date is best shown by results obtained which are set out in the following table for a number of the principal municipalities in this district:—



General View of the lower portion of Port Stanley Park and L. & P.S. Ry. Station



Electric Locomotive handling local freight, L. & P.S. Ry.



Pulling out cars from McClary's Siding, L. & P.S. Ry.



Trains Passing at Whites, L. & P.S. Ry.

PIONEER HYDRO MUNICIPALITIES

MUNICIPALITY	PLANT	OTHER ASSETS	LIABILITIES	RESERVES	SURPLUS
Toronto	\$11,137,720.02	\$3,481,726.48	\$10,353,184.50	\$4,045,188.76	\$ 221,073.23
London	1,323,951.45	545,985.41	987,403.30	495,656.78	386,876.78
Guelph	271,577.84	139,202.32	130,531.92	137,633.99	142,609.25
Stratford	334,415.01	116,859.69	238,587.36	167,497.02	45,190.32
St. Thomas	287,692.37	100,317.14	110,647.07	124,409.89	152,952.55
Woodstock	218,861.42	92, 67.82	107,885.63	111,990.97	91,852.64
Kitchener	482,988.11	104,308.95	219,340.07	228,661.54	139,295.45
Hespeler	40,827.84	19,286.05	17,178.93	36,842.21	6,092.75
Preston	130,279.96	31,215.10	65,917.28	69,437.64	26,140.14
Waterloo	160,529.10	36,487.77	98,963.50	54,823.91	43,229.46
New Hamburg	28,576.25	12,009.44	16,746.04	13,725.02	10,114.63
Ingersoll	113,298.82	69,979.20	87,023.06	47,601.41	48,653.55
	\$14,530,718.19	\$4,750,245.37	\$12,433,408.66	\$5,533,474.14	\$1,314,080.76

"Other Assets" includes Bank Balance, Security Investments, Accounts Receivable, Inventories, Sinking Fund Deposits and Operating Surplus.

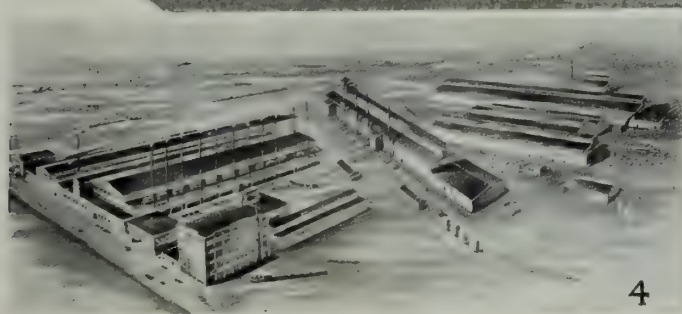
Original Twelve Municipalities to Enter Partnership have Rates Reduced 75 per cent.

The following is a statement showing the financial standing of the original 12 municipalities which went into co-partnership in order to obtain Hydro-Electric power for themselves in 1908.

Municipality	COST OF POWER, 1920.		AVERAGE RATE PER KW-HR. IN 1920		
	To Municipality	To Customer	per H.P.		Old Rate
	per H.P.	per H.P.	Domestic	Commercial	
Toronto	\$17.00	\$19.50	2.2c.	2.2c.	{ Dom. 8c. plus 25c. } { Comm. 12c. plus 25c. }
Hamilton	16.00	12.70	2.3c.	1.3c.	{ Dom. 8c. plus 25c. } { Comm. 8c. }
London	19.00	18.00	2.2c.	1.8c.	9c. plus 25c.
St. Thomas	24.00	18.00	2.6c.	2.2c.	11c.
Guelph	19.00	16.00	2.6c.	2.2c.	{ Dom. 8c. plus 25c. } { Comm. 8c. plus 15c. }
St. Mary's	28.00	32.50	3.1c.	3.0c.	9c. plus 15c.
Waterloo	20.00	20.00	2.3c.	2.3c.	12c. plus 25c.
Hespeler	21.00	25.50	4.1c.	3.5c.	10c. plus 15c.
Windsor	36.00	35.00	3.2c.	3.2c.	{ Comm. 8c. } { Dom. 12c. }
Sarnia	36.00	35.00	4.3c.	5.0c.	{ Dom. 6c. } { Comm. 5.4c. }
Stratford	25.00	28.00	2.1c.	2.4c.	{ Dom. 12c. plus 25c. } { Comm. 12c. plus 25c. }
Woodstock	20.00	18.00	2.4c.	2.1c.	8c. plus 20c.
Preston	19.00	20.00	2.8c.	2.7c.	9c. plus 20c.
New Hamburg	32.00	31.00	4.1c.	4.3c.	10c.
Ingersoll	21.00	20.00	3.5c.	2.4c.	8c. plus 25c.



(1) Coniagas Reduction Co., Thorold; (2) Dain Manufacturing Co., Dainville; (3) American Cynamid Co., Niagara Falls; (4) Union Carbide Co., Welland; (5) Page & Hersey, Welland



(1) *Electro Metals, Welland*; (2) *Canada Cement Co., Ltd., Port Colborne*; (3) *Ontario Paper Co., Thorold*; (4) *Dominion Foundries and Steel Co., Hamilton*; (5) *Canadian Yalg & Towne, Ltd., St. Catharines*.



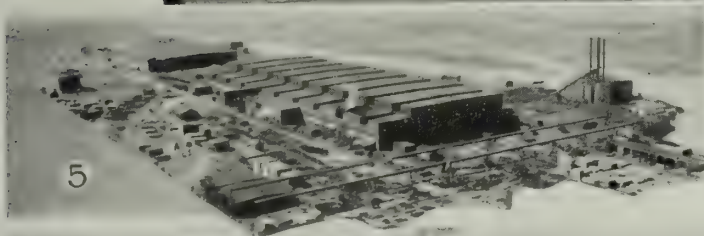
(1) Canadian Sirroco Co.; (2) Frederick Stearns & Co.; (3) U. S. Playing Card Co.; (4) Kelsey Wheel Co.; (5) Canadian Postum Cereal Co.; (6) Moloney Electric Co. of Canada; all of Windsor Ont.



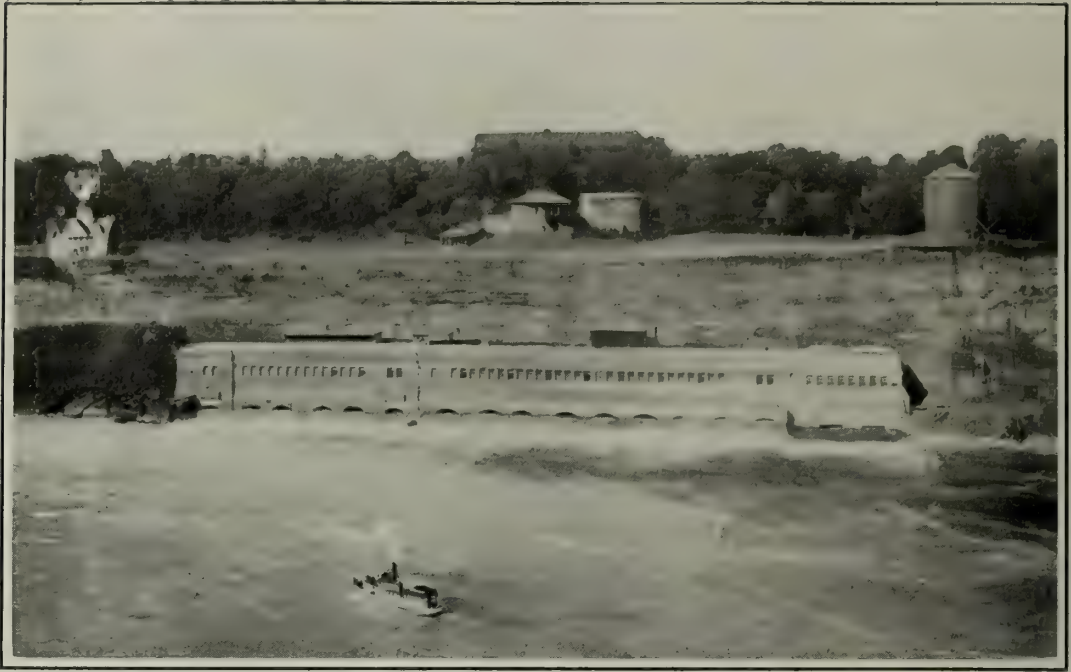
(1) *Toronto Carpet Mfg. Co., Ltd.*; (2) *Wm. Neilson, Ltd.*; (3) *Methodist Book & Publishing House*; (4) *Willys-Overland, Ltd.*; (5) *Wm. Davies Co., Ltd.*; (6) *Massey-Harris, Ltd.*; all of Toronto, Ont.



(1) *Beaver Wood Fibre Co., Ltd., Thorold, Ont.*; (2) *"W., G. & R." Factory, Kitchener, Ont.*; (3) *McClary Mfg. Co., London, Ont.*; (4) *Goodyear Tire & Rubber Co. of Canada, New Toronto, Ont.*; (5) *Canadian Steel Foundries, Welland, Ont.*; (6) *Imperial Oil, Ltd., Sarnia, Ont.*



(1) Provincial Paper Mills, Thorold, Ont.; (2) Otis-Fensom Elevator Co., Hamilton, Ont.; (3) Hunt Brothers, London, Ont.; (4) Lake Simcoe Ice Supply Co., Toronto, Ont.; (5) National Steel Car Co., Hamilton, Ont.; (6) Burlington Steel Co., Hamilton, Ont.

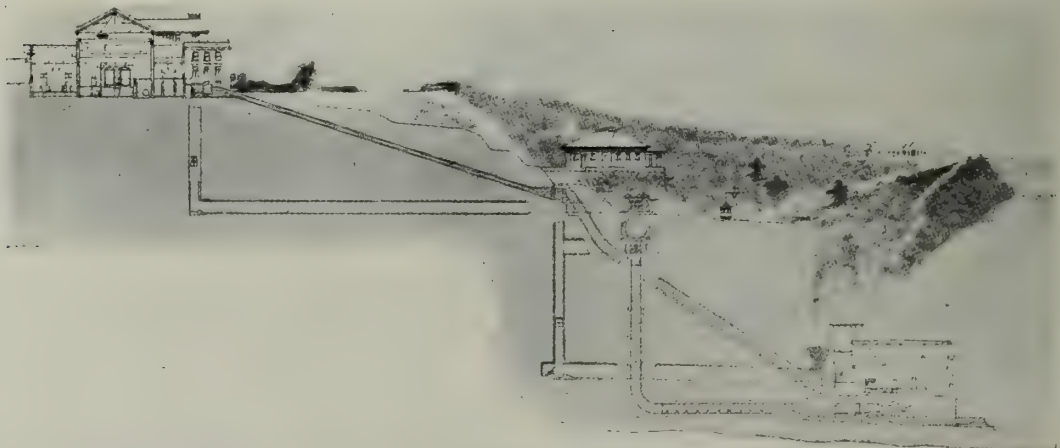


Generating Station, Overflow, Surge Tanks and Distributing Station of the Ontario Power Company, as seen from Goat Island

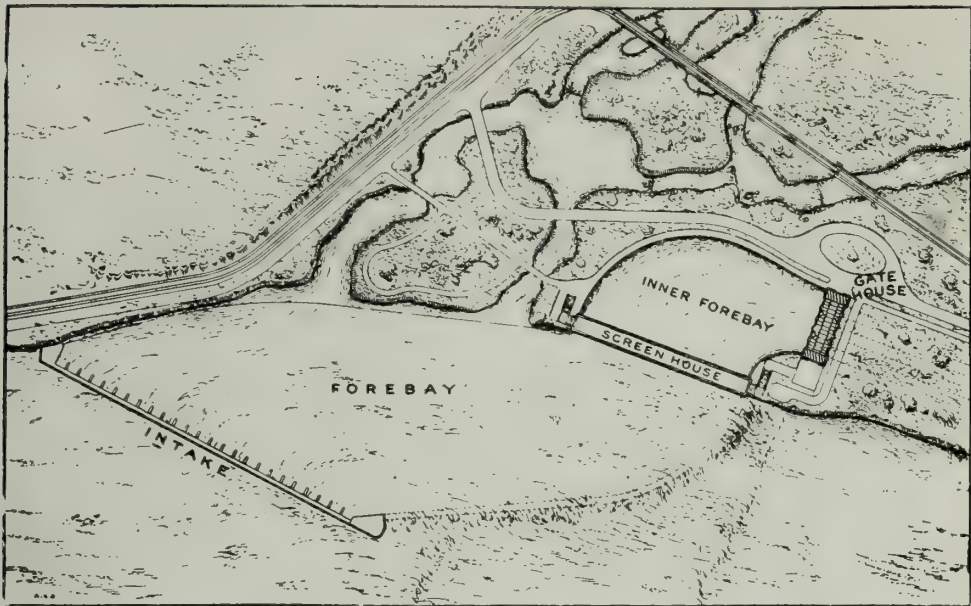
At the end of 1912 the combined load of these original municipalities was 16,615 horsepower, now it is 90,799 horsepower. Eight of the twelve now have a surplus sufficient to cover their indebtedness to the Province. Considering the whole twelve jointly, the aggregate of reserves and surplus available is over five and a half million dollars as against outstanding obligations totalling not quite eleven and a half millions.

LONG TERM CONTRACT FOR POWER AT LOW RATE

When the Commission first commenced operations in this District a contract for power was made with the Ontario Power Company for 100,000 horsepower at \$9.00 per horsepower per year. So rapid, however, was the growth of the demand in the district that in 1916 all this power was used



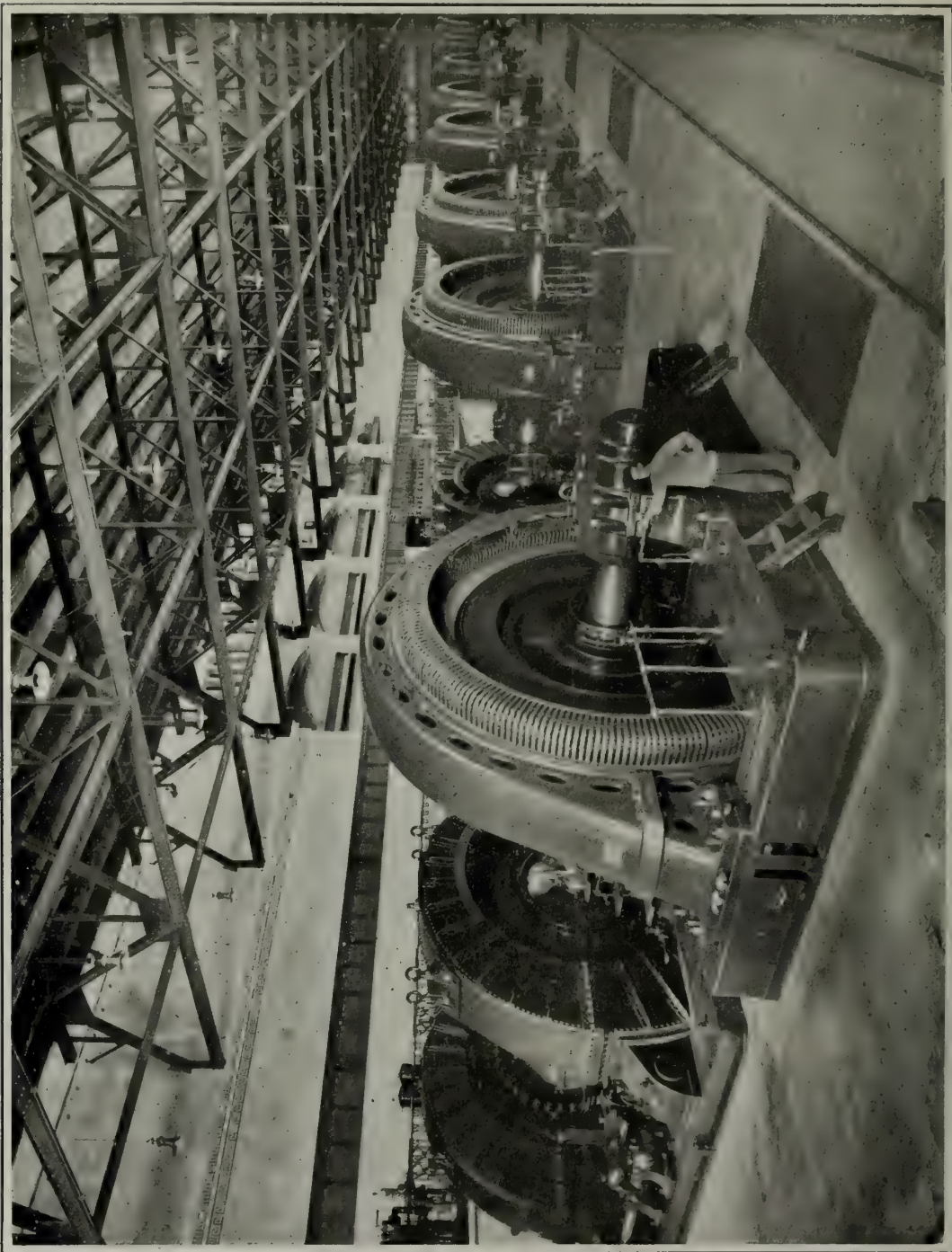
Section through Generating and Distributing Stations, Ontario Power Company



Plan of Intake Works, Ontario Power Company



Entrance Building, Ontario Power Company



Interior of the Generating Station, Ontario Power Company

up and the Commission made another contract with the Canadian-Niagara Power Company for an additional supply of 60,000 horsepower.

COMMISSION PURCHASES GENERATING PLANT

In 1917 the Commission purchased the entire plant of the Ontario Power Company, having at that time a total capacity of 162,000 horsepower, and in 1918, to meet the urgent demands for power for the manufacture of war munitions, an extension to this plant was made having a capacity of approximately 40,000 horsepower, so that this plant at the present time has a total capacity of approximately 200,000 horsepower.

The Commission has a contract with the Electrical Development Company for a supply of 13,200 horsepower, hence the Commission is now supplying from Niagara Falls a total of approximately 275,000 horsepower.

ONTARIO POWER COMPANY'S DEVELOPMENT.

Work on this scheme was commenced in 1902, and power was first supplied in 1905. In the year 1917 the Hydro-Electric Power Commission

purchased the entire stock of the Company for \$8,000,000, and also assumed the debenture and bonded indebtedness of the Company for an additional amount of \$14,450,000. Since that time approximately \$3,500,000 has been spent to increase the capacity of the plant from 160,000 to 200,000 horsepower.

The head-works comprising intake, diverting dam, outer forebay, screen house, inner forebay and gate-house were all constructed suitably for the ultimate capacity of the development, viz.: 200,000 horsepower, but the other portions of the work were carried out more or less in stages keeping pace with the actual development. Thus, at the time when the Commission took over the plant, there were only two 18-foot conduits installed to convey water from the head-works to the power house, and 14 horizontal turbines, each coupled to its own horizontal generator, with an aggregate capacity of 160,000 horsepower.

On account of the great demands for power during the war, the Commission found it necessary, immediately after taking over this plant, to install a third conduit, which is a wood stave pipe line of 13½ feet internal diameter, together with two



Wood Stave Pipe Line during Construction

extra turbines and generators and auxiliary equipment, which increased the capacity of the entire plant to the present figure of 200,000 horsepower.

QUEENSTON-CHIPPAWA POWER DEVELOPMENT.

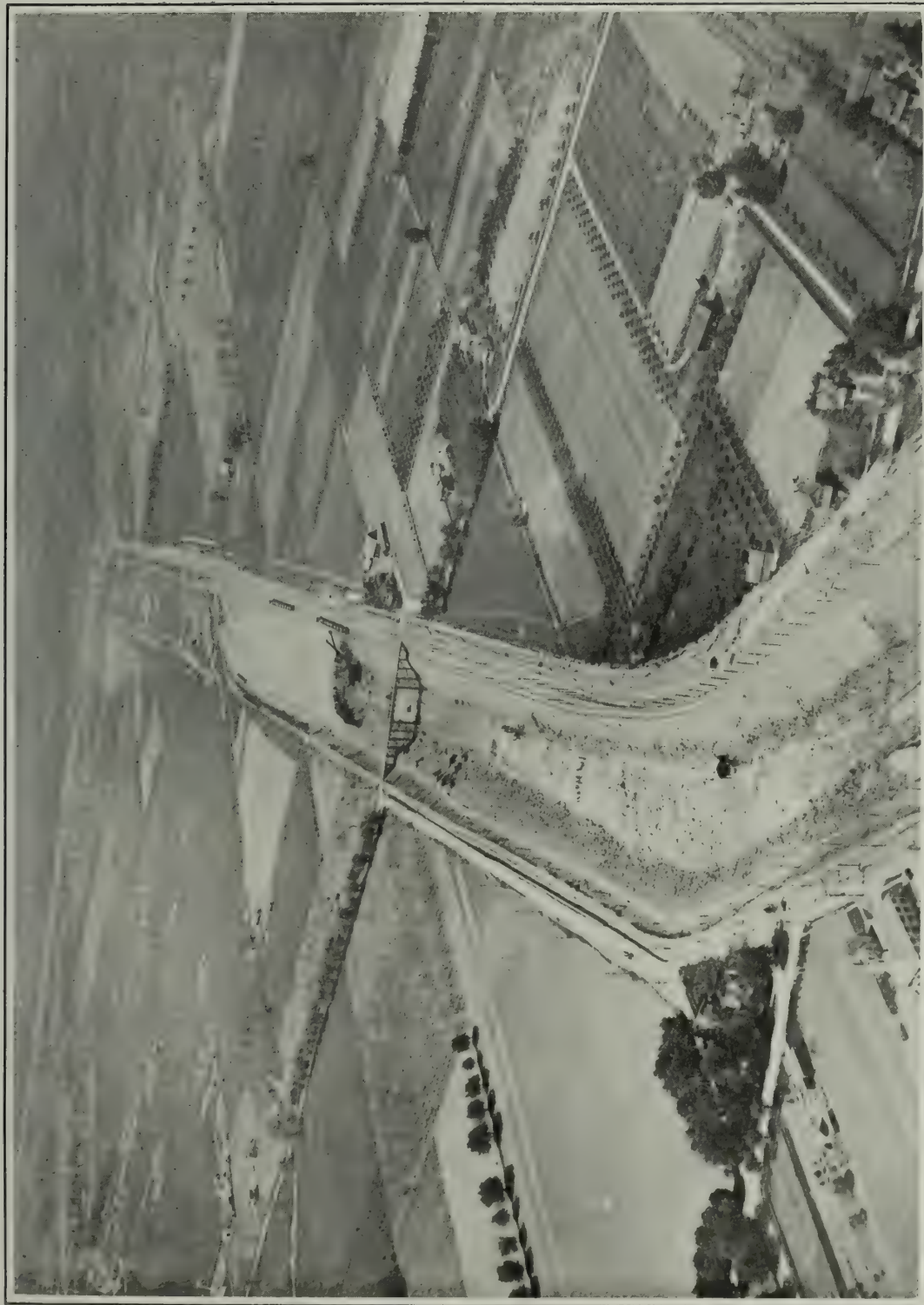
Realizing that the present available power supply in the Niagara District would be exhausted before 1920, the Commission in 1913 requested the Ontario Government to allow it to proceed with the construction of a large plant at Queenston. The legislation necessary in order that this work might

be undertaken was not, however, obtained until 1917, when the great demand for power for the manufacture of war munitions entirely used up all of the available power supply at that time. In May, 1917, actual construction work on the Queenston-Chippawa Development was commenced.

This great work involves the construction of a canal which will convey water from the upper Niagara River to a point near Queenston, where the largest power plant in the world will be located. This arrangement will permit of using the full



Bird's-eye View of Queenston-Chippawa Power Development



Aeroplane view of the Power Canal, Queenston-Clippawa Power Development (under construction)

available head of water between Lake Erie and Lake Ontario, which is more than twice the available head of the other power plants at Niagara Falls, thus delivering twice the amount of power from the same diversion of water.

Some of the outstanding features of the canal, the power house, and the equipment being used in their construction are as follows:

THE CANAL

Length $12\frac{3}{4}$ miles.
Total excavation in earth..... 11 million cu. yds.
Total excavation in rock..... 4 million cu. yds.

The portion of the canal excavated in earth will have sloping sides, the width of the bottom being 70 feet, and at the top 162 feet; the average depth of the water will be about 30 feet. The rock portion of the canal will have vertical sides with a width of 48 feet and an average depth of water of 40 feet.

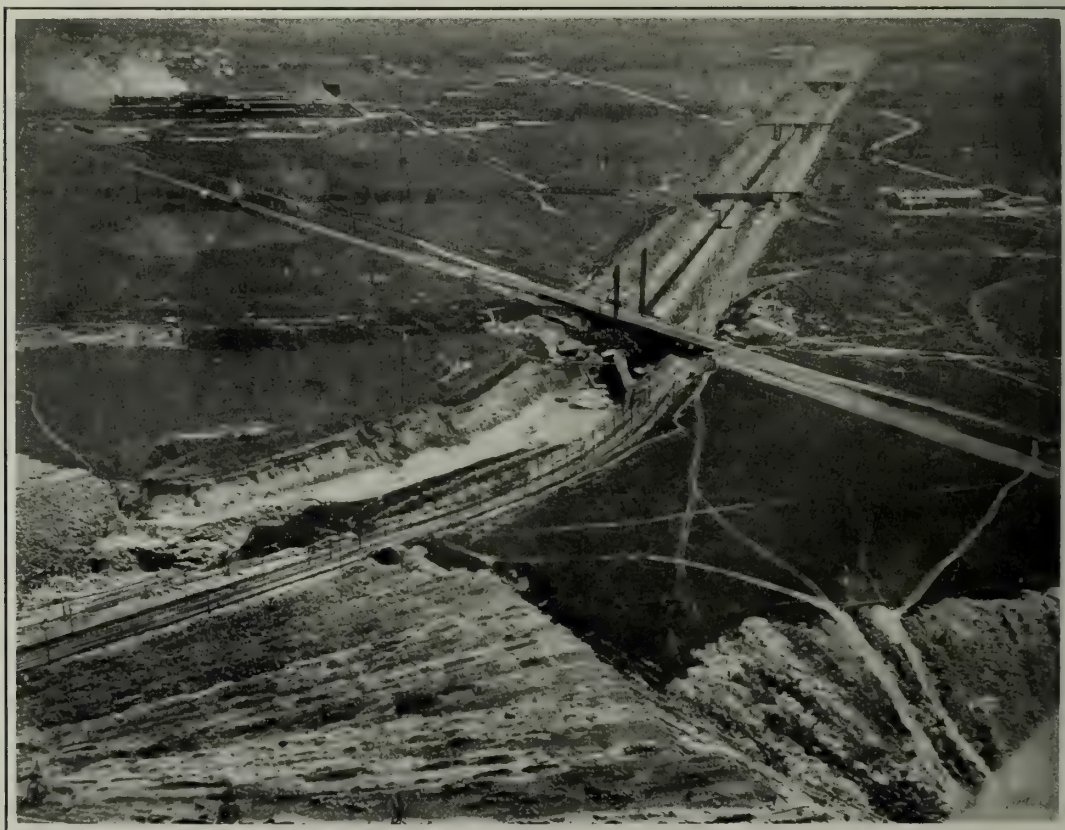
The net head of water utilized in this development will be 305 feet, and the capacity of the canal will be from 15,000 to 18,000 cubic feet per second.

WORLD'S LARGEST POWER HOUSE

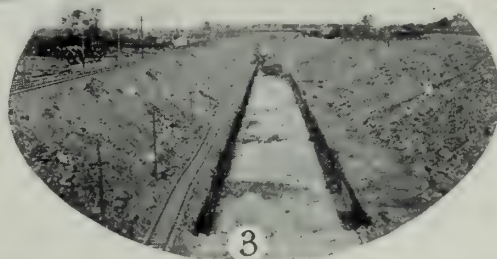
The power house will contain the largest turbines and generators in the world, each of the former being of 55,000 horsepower capacity, coupled to an electric generator of equivalent size.

At the present time there are five of these immense units on order, two of which are now being installed.

The entire project, up to an initial capacity of 100,000 horsepower will, it is expected, be completed in the fall of 1921, and, about six months later three additional generating units will be installed, thus bringing the capacity up to 250,000 horsepower. The ultimate capacity of the generating station will be approximately 450,000 horsepower.



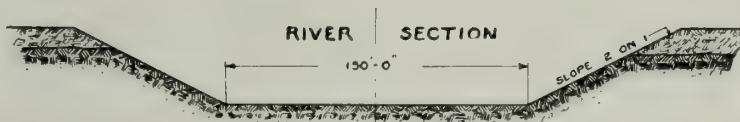
Queenston-Chippawa Power Canal (under construction)



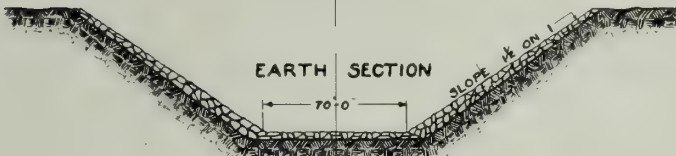
(1) Electric shovel operating in rock; (2) Electric shovel excavating earth and loading cars; (3) Power Canal, looking north from N. S. & T. Ry. bridge; (4) Power Canal from Bowman's Ravine; (5) Electric shovel at work (these shovels are the largest in the world); (6) View through the Power Canal from the floor of the Forebay.



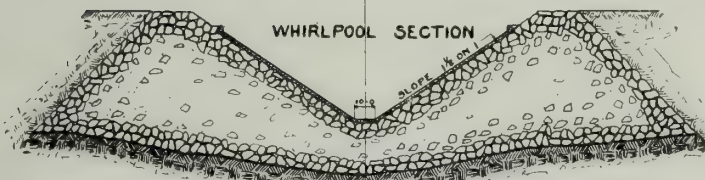
(1) Cableway Excavator in Welland River; (2) Cableway excavator from east bank of Welland River; (3) Site of the World's Largest Power House; (4) Drilling wall of Forebay; (5) Dredge loading a scow opposite Hog Island, at the mouth of the Welland River.



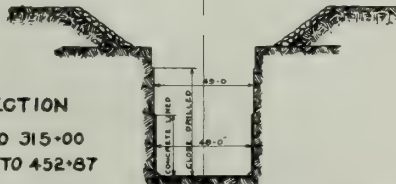
STA. 34+40 TO 244+40
RIVER CHAINAGE



STA. 0+00 TO 65+00
CANAL CHAINAGE



STA. 335+00



STA. 65+00 TO 315+00
AND 365+00 TO 452+87

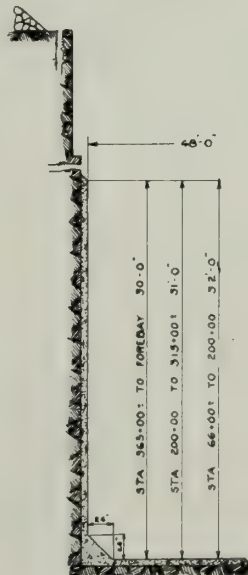
Intake Loss and Velocity Head
in River Section 0.500

Roughness Factor in River Section
 $n = .035$

Roughness Factor in Earth Section
 $n = .035$

Roughness Factor in close-drilled rock
above concrete lining in Rock Section
 $n = .033$

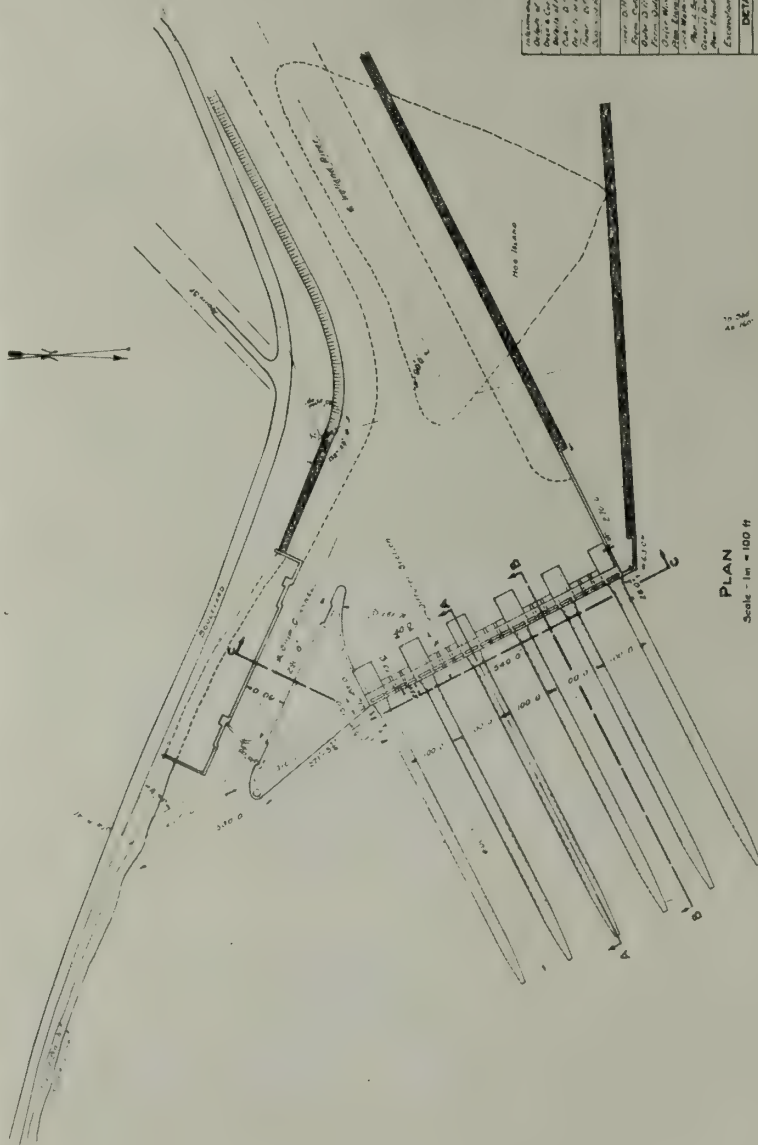
Roughness Factor in concrete lining
as shown



HALF SECTION
SHOWING CONCRETE LINING

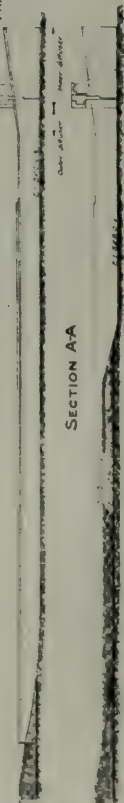
This drawing supersedes 7-3-181-E

Sections of the Power Canal



PLAN
Scale - 1 in = 100 ft

SECTION A-A



SECTION B-B



SECTION C-C

Scale - 1 in = 50 ft

DETAILS	DATE	REVISIONS
1. General Plan	7-2-48	1
2. Section A-A	7-2-48	1
3. Section B-B	7-2-48	1
4. Section C-C	7-2-48	1
5. Foundation Plan	7-2-48	1
6. Elevation Plan	7-2-48	1
7. Section D-D	7-2-48	1
8. Section E-E	7-2-48	1
9. Section F-F	7-2-48	1
10. Section G-G	7-2-48	1
11. Section H-H	7-2-48	1
12. Section I-I	7-2-48	1
13. Section J-J	7-2-48	1
14. Section K-K	7-2-48	1
15. Section L-L	7-2-48	1
16. Section M-M	7-2-48	1
17. Section N-N	7-2-48	1
18. Section O-O	7-2-48	1
19. Section P-P	7-2-48	1
20. Section Q-Q	7-2-48	1
21. Section R-R	7-2-48	1
22. Section S-S	7-2-48	1
23. Section T-T	7-2-48	1
24. Section U-U	7-2-48	1
25. Section V-V	7-2-48	1
26. Section W-W	7-2-48	1
27. Section X-X	7-2-48	1
28. Section Y-Y	7-2-48	1
29. Section Z-Z	7-2-48	1

Note: This Drawing Supersedes 7-2-48-1

NIAGARA DEVELOPMENT
INTAKE

GENERAL PLAN AND SECTIONS

Scale: As Shown Date: Jan 14, 1951

HYDRO-ELECTRIC POWER COMMISSION
HYDRAULIC DEPARTMENT

Submitted: _____ Approved: _____

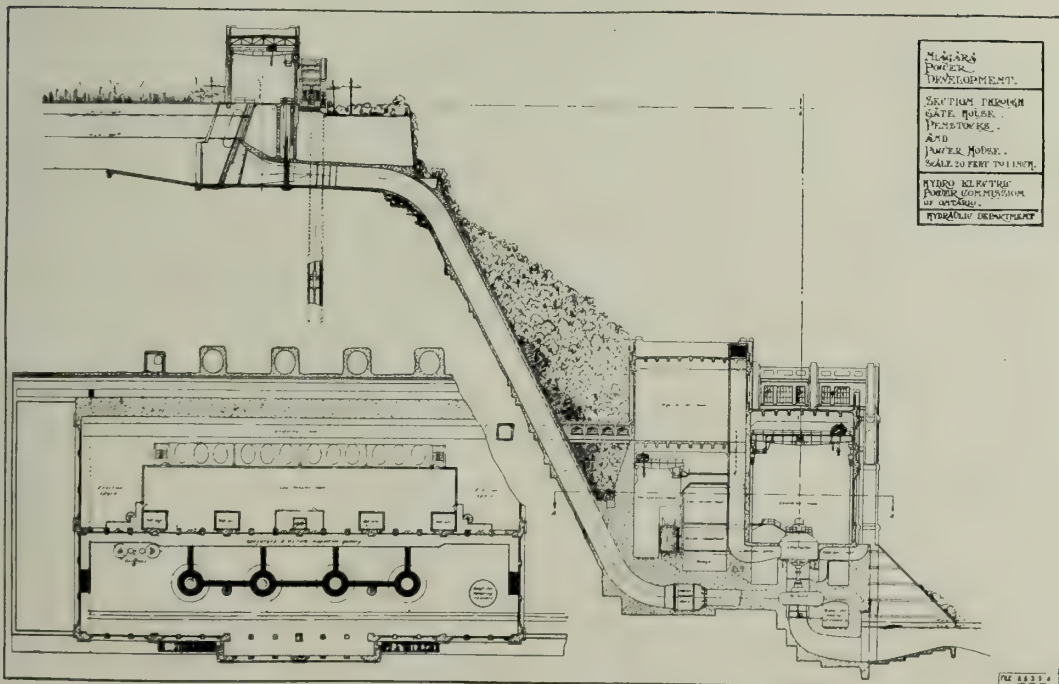
Drawn: _____ Checked: _____

FILE

General Plan and Sections of Intake, Queenston-Chippawa Power Development



Electric Shovel loading train, Queenston-Chippawa Power Development



Section Through Gate House, Penstocks and Power House

CONSTRUCTION EQUIPMENT.

Owing to the shortage and high cost of both labor and coal, it was decided to make the utmost use of labor-saving devices and electrically operated equipment is being used as much as possible.

For the work of excavating, there are in use 7 electrically operated shovels. Three of these are the largest in the world, being considerably larger than the shovels used in the construction of the Panama Canal; they handle an eight cubic yard bucket for earth, and a five cubic yard bucket for rock; motors aggregating no less than 750 horsepower are required to operate each; they weigh over 400 tons each, and have a capacity, when used for excavating earth, of 150,000 cubic yards per month per shovel and of 70,000 cubic yards when used for rock. These shovels can load cars standing 73 feet above their location.

Beside the electric shovels there are three steam shovels as well as 17 channelers and numerous rick drills, while for a $4\frac{1}{2}$ -mile section of the Canal, which will be formed out of a portion of the Welland River, a dredge and cable-way with a clam-shell excavator, are being employed.

In order to efficiently carry away the enormous amount of excavated material on this work, a standard gauge double-track electric railway, in

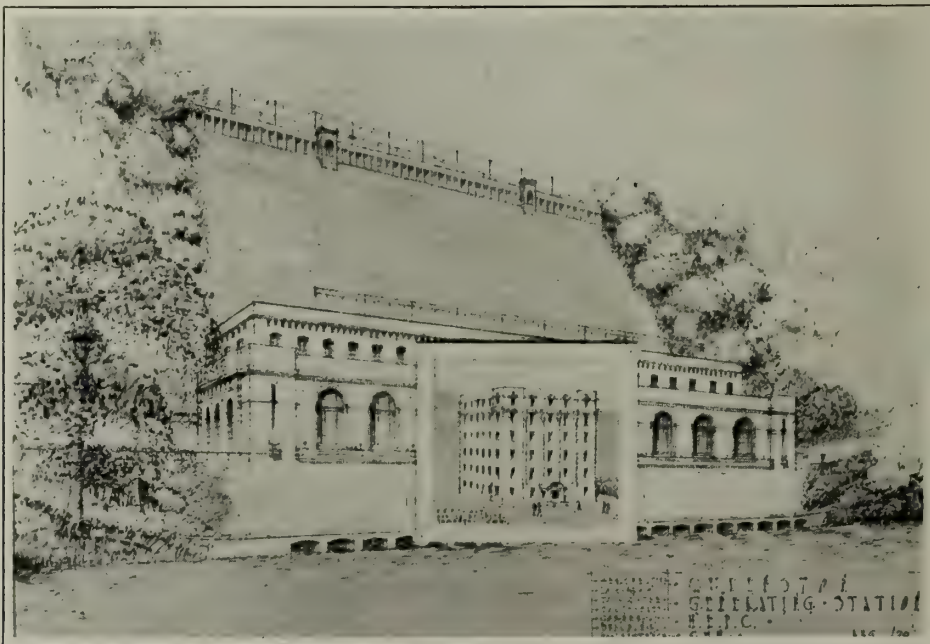
which standard 80-lb. main line rails have been used, has been constructed along the entire route of the canal, with a branch to the disposal area, where the excavated material is dumped. The rolling stock for this railway consists of 21 electric and 10 steam locomotives, beside 225 air-dump cars of 20 cubic yards capacity each.

In order to expedite the work as much as possible a considerable amount of additional equipment has been ordered, including one 6 cubic yard Marion steam shovel, sixty-one air-dump cars similar to those already in use; three more electric locomotives are being built and orders for two more are being contemplated.

Ten thousand electrical horsepower is required to operate the electric railway, electric shovels and other machinery and equipment used on the construction work.

It will be necessary to build seventeen railway and highway bridges across the canal at various points.

The large amount of power obtained from this development will be sufficient to take care of the needs of the district for several years, and it is expected that this large supply of cheap power will result in even greater industrial development than that which has already taken place.



New Generating Station at Queenston. (Inset shows the Commission's Administration Building in Toronto drawn to the same scale, giving an idea of the magnitude of the structure.)

HOW POWER IS SUPPLIED TO THE MUNICIPALITIES BY THE COMMISSION

Power is supplied to the Municipalities *at cost*, and monthly bills are submitted to the Municipalities for power supplied based on an estimated rate per horsepower per year, and, at the end of each year a Thirteenth Power Bill is submitted, debiting or crediting each Municipality with the difference between the amount already paid in monthly

payments and the actual cost of service for the year.

The following is a typical Municipal Hydro Operating Report, and shows, in detail, the distribution of money collected from Hydro customers. This statement shows conclusively that Hydro Municipalities are required in their power bills to meet all operating expenses and fixed charges on their Systems, as well as to provide an adequate fund for renewals.

TYPICAL MUNICIPAL HYDRO OPERATING REPORT

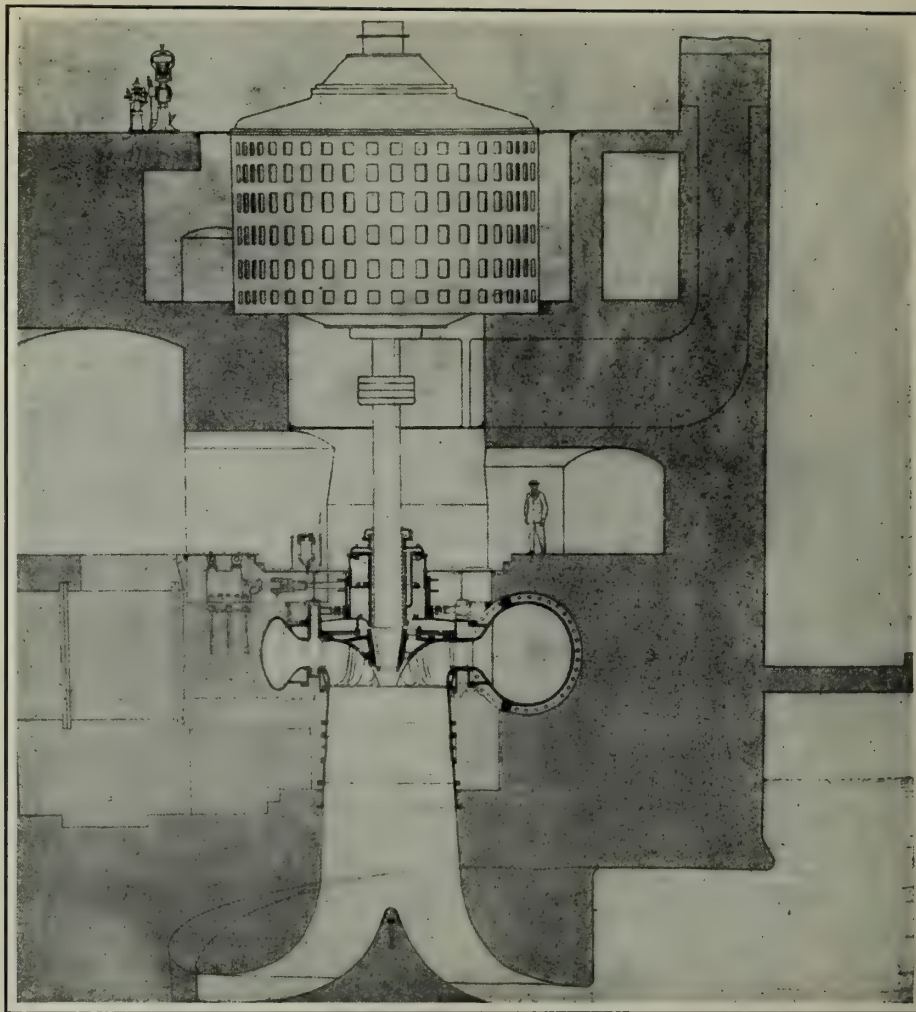
REVENUE obtained for Electric Service rendered, during the year ending December 31, 1920 \$497,166.68

EXPENSES:

Paid by Local Utility to the Commission to meet the cost and transmission of Power as ascertained by Annual Adjustment—	
Cost of Power at Niagara Falls	\$123,057.64
Interest on the Commission's Capital proportioned to the Municipality	33,922.78
Cost of Operating and Maintaining this share of Capital.....	35,014.22
Set aside to meet Contingencies and to provide a Renewal Fund for this share of Plant	19,068.57
A deposit to Sinking Fund to liquidate this share of Capital	13,405.27
Actual Cost of Power to Commission paid by Municipality.....	\$224,468.48

MUNICIPAL UTILITY'S EXPENSES

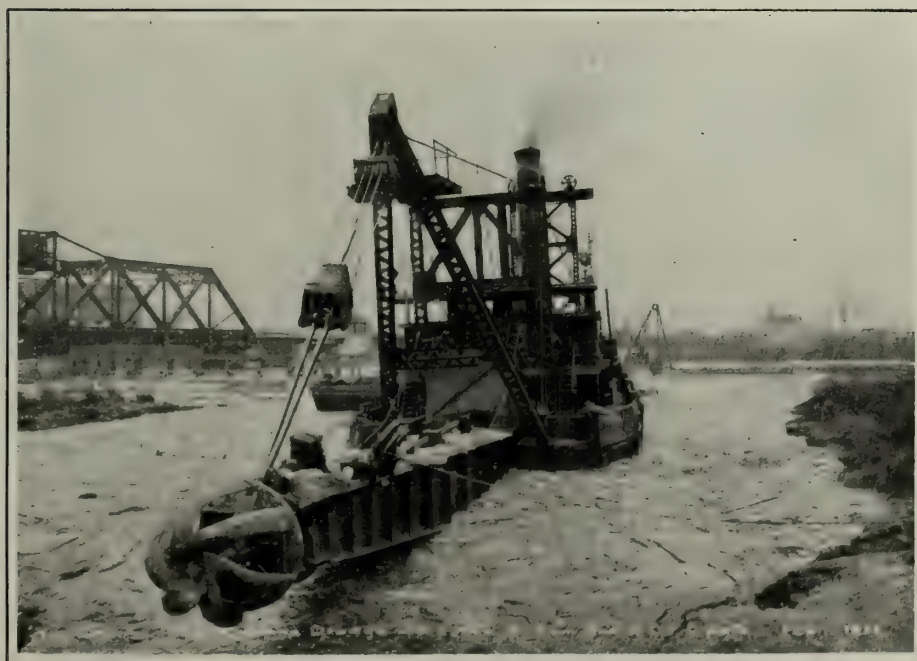
Sub-Station Operation	\$17,187.51	
Sub-Station Maintenance	1,400.28	
Distributing System Operation and Maintenance.....	8,220.18	
Line Transformer Maintenance	2,894.12	
Meter Maintenance	16,244.38	
Consumers' Premises Expenses	6,933.08	
Street Lighting System Operation and Maintenance	7,642.86	
Promotion of Business	2,625.33	
Billing and Collecting	18,507.43	
General Office Salaries and Expenses	26,863.70	
Undistributed Expenses	26,708.72	
Interest and Debenture Payments	60,816.15	
Provision on Account of Plant Renewal.....	52,593.56	
		\$248,637.30
Total Cost of supplying Electric Service in this Municipality for one year.....	\$	473,105.78
SURPLUS	\$	24,606.90



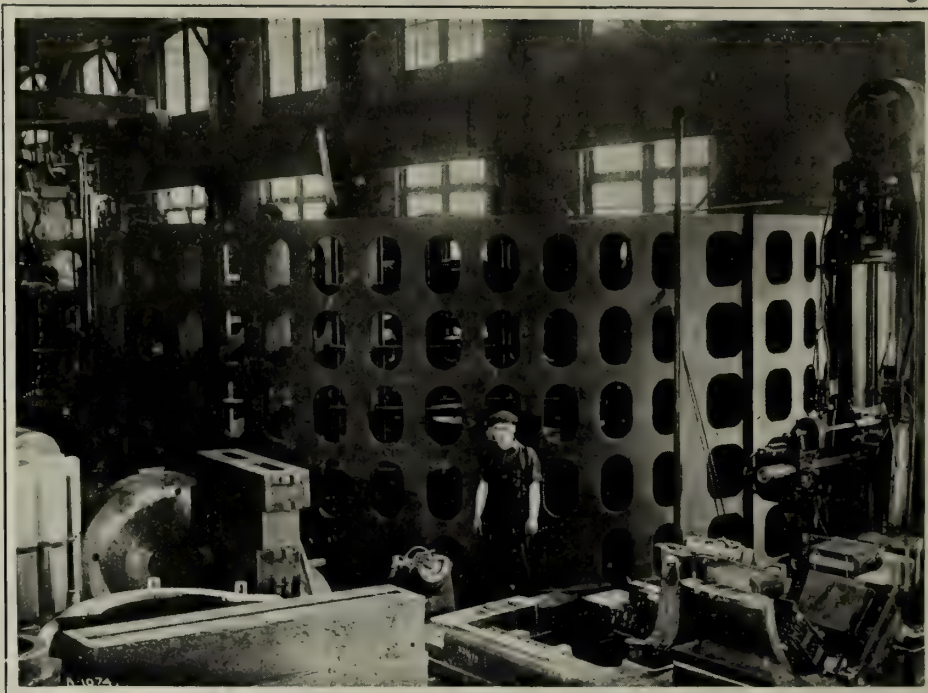
Sectional view through the new Queenston Generating Station



The Dredge "Cyclone" at work in the Welland River



The "Cyclone" with its cutter exposed



The frame of one of the new Generators, Queenston Generating Station



Half of an upper bracket for one of the Generating Units in course of construction, Queenston Generating Station

COMBINED HYDRO MUNICIPAL BALANCE SHEET, DECEMBER 31st, 1920

REVENUE:

Received from Hydro customers \$8,542,304.27

EXPENSES:

PAID TO HYDRO-ELECTRIC COMMISSION AS "COST OF POWER"

Cost of Generation and Transformation at Niagara Falls.....	\$1,966,304.34
Cost of administering, maintaining and operating Commission's Trans- former Stations and Transmission Lines.....	585,098.63
Interest on Commission's Capital Investment in Stations and Lines.....	644,859.37
Renewal Reserves, yearly provision for Plant Renewal purposes.....	310,519.12
Contingencies—Yearly provision	37,500.00
Payments to Sinking Fund—yearly provision	195,569.61

Total Cost to Commission for Generating, Transforming and Trans- mitting Electrical Energy	\$3,739,851.07
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MUNICIPALITIES' LOCAL EXPENSE

Cost of administering, operating and maintaining Muni- cipal Sub-stations and Distribution Systems, etc.....	\$1,073,546.69
Cost of billing and collecting, promotion of business and consumers' premises expenses	435,127.78
General Office—Salaries and expenses	461,113.40
Debenture, Sinking Fund and Bond Interest payments.....	1,184,802.94
Undistributable expense	226,356.34
Renewals Reserve—yearly provision for Municipal Plant Renewal purposes	769,787.11
	<u>4,150,734.26</u>

Total Cost of supplying service to Hydro Customers.....	7,890,585.33
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SURPLUS	\$ 651,718.94
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ASSETS:

Hydro-Electric Power Commission's Plant (Lines and Stations) appor- tioned to Municipalities as per Column 3	\$14,969,018.65
Municipal Systems and other Plant Assets.....	30,776,611.56
Development Plant at Niagara Falls, etc. (Ontario Power Company).....	27,306,583.49

TOTAL ASSETS	\$73,052,213.70
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LIABILITIES:

Hydro-Electric Power Commission's borrowings from Provincial Government, apportioned to Municipalities as per Column 8.....	\$14,969,018.65
Municipalities Debenture Debt and other Liabilities in respect of Local Systems	18,640,645.20
Ontario Power Company's Debenture Debt and other Liabilities in respect of Development Plant at Niagara Falls.....	25,752,353.35
TOTAL LIABILITIES.....	\$59,362,017.20

RESERVES:

Sinking Fund, Plant Renewal and other Reserves.....	\$10,890,873.46
Surplus	2,799,323.04
	<hr/> \$13,690,196.50
TOTAL LIABILITIES, RESERVES AND SURPLUS.....	\$73,052,213.70

UNIFORM ACCOUNTING

The accounts of every Hydro-Electric Utility are kept in a uniform manner in conformity with the Accounting System published by the Commission. This code was prepared by a special committee of Chartered Accountants and Engineers and follows the general practice of public service corporations in the United States with such minor changes as were necessary to adapt it to a system financed by debentures rather than capital stock.

The Hydro Department balance sheets of all the Municipalities in the Niagara System as at December 31, 1920, have been combined into one, and is shown in this booklet. The municipal investment in plant is shown divided into its principal component parts and in the last line will be found the proportion of the Hydro-Electric Power Commission's System which they have assumed. The current assets are also set out in sufficient detail that further explanation is hardly necessary. The

sinking fund deposited with the municipal treasurer is the provision already made for the retirement of local sinking fund debentures, while the sinking fund with the Hydro Commission is the progress already made toward paying off the Commission's investment above mentioned. The renewal fund is in respect of the Hydro Commission's System only and not the local distributing Systems, for which a provision of over three million dollars will be found among the Reserves. The local systems being largely financed with serial debentures calling for a payment on principal each year instead of a sinking fund; such payments have been charged direct to the Debenture Balance Account and properly appear among the Reserves as "Debentures Paid." Strictly speaking "Debentures Paid," and the Sinking Fund Reserve for both local Systems and Provincial Commission's Plant may quite properly be considered as Surplus and added to the free Surplus, making a total Surplus from operation of nearly \$4,800,000.00.



The Horseshoe Falls—Illuminated by the Hydro-Electric Power Commission of Ontario

DISTRICT IN PROVINCE OF ONTARIO AND NEW YORK STATE SUPPLIED WITH POWER FROM NIAGARA FALLS BY THE
HYDRO-ELECTRIC POWER COMMISSION OF ONTARIO AND THE ONTARIO POWER COMPANY.



STATEMENT SHOWING GROWTH OF THE NIAGARA SYSTEM FOR THE PAST EIGHT YEARS

Table with 5 columns: Year, Assets, Liabilities, Reserves, and Surplus. Rows for years 1913 to 1920.

The Commission submits a financial statement showing the accumulative results of operation of the Niagara System to December 31, 1920, which should clearly show the relation of the general public to the various schemes of power development and distribution administered and controlled by the Commission, which, during the past ten years, have so noticeably advanced the social and economic prosperity of the Province.

THE CONDENSED STATEMENT

Condensed financial statement showing Assets, Liabilities, Reserves, and Surplus for 1920.

It will be observed that there is a total investment in plant and other assets of over seven million dollars, including the assets of the Ontario Power Commission, Niagara Falls, purchased August, 1917, against which the Province has a liability of \$14,969,018.65.

The columns of the Balance Sheet explained: Column 1 gives the names of the Municipalities now under contract with the Hydro-Electric Power Commission of Ontario for a supply of electricity.

Column 2 gives the amount of electrical power supplied to each Municipality by the Hydro-Electric Power Commission of Ontario during the year.

Column 3—The cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 4—The cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 5—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 6—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 7—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 8—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 9—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 10—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 11—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 12—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 13—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 14—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 15—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 16—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Column 17—The Municipalities' share of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

providing for every expense of Operating and Maintaining their local Systems, meeting payments in respect of all Debenture Debt (Local and Provincial), and providing a fund for the renewal of the whole Utility within approximately twenty-five years from the date of commencement of operation of the System.

SUMMARIZED REVENUE AND EXPENSE ACCOUNT FOR THE YEAR 1920, COMBINING REVENUE AND EXPENSES OF ALL HYDRO UTILITIES CONNECTED TO THE NIAGARA SYSTEM.

Summary of Revenue and Expenses for 1920, including items like Received from Hydro customers, Expenses, and Total cost of supplying service.

Column 15—Total Reserves and Surpluses as given in Columns 12, 13 and 14.

Referring to the figures of the first column on the asset side of the Balance Sheet, headed as follows, "Proportionate share of Hydro-Electric Power Commission's Plant to serve Municipalities," a certain by Annual Adjustment, and again appearing as liabilities under a similarly worded heading, it will be noted that the total of each of these columns has been adjusted to the participating Municipalities.

Each municipality is required to assume responsibility for just that portion of capital employed in delivering electricity energy to it, together with such expenses, as named, incident to that particular portion of the investment as are not charged with expenses connected with equipment or plant from which they derive no benefit or are in no way interested.

By annually adjusting the System's investment and operating expenses, the Commission's collection of the share of expense to be borne by each of the co-operating municipalities. When the Commission's collections throughout the year from any municipality prove to be insufficient to meet all requirements, as hereinbefore mentioned, the additional sum is charged to the municipality and reflected in the Utility's records for that year; when collections exceed the expense the difference is refunded, such refund affecting the Utility's current operating record.

The following figures show exactly what it cost the Commission to generate, transform and transmit electrical energy to these municipalities for the year 1919-1920.

Niagara Falls, Windsor, and other municipalities are listed with their respective shares of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

The accompanying statement shows conclusively that the Corporation does not operate at a profit or loss; it functions purely as an administrator and trustee for each municipality.

The Revenue and Expense Statement for the year 1920 gives the total sum collected from customers of the service and exhibits the expenses in two distinct sections; the first section shows the amount received by the Hydro-Electric Power Commission as the cost of power to it (divided so as to reflect the various items which are comprised in this expense) and the other section shows the disposition by the municipalities of the balance of the revenue collected from the service.

Niagara Falls, Windsor, and other municipalities are listed with their respective shares of the cost of the Hydro-Electric Power Commission's Plant, Transmission Lines, and other equipment.

Cost of this power to the Commission—\$35,734.47

Cost of generating and transforming at Niagara Falls—\$3,500.31

Cost of administering, maintaining and operating Commission's transforming stations and transmission lines—\$2,088.80

Interest on municipalities' share of Commission's capital investment in stations and lines—\$1,273.68

Renewal reserve yearly provision for plant renewal purposes—\$699.06

Contingencies—yearly provision—\$661.23

Payment to Sinking Fund—None

Niagara Falls not yet operating five years.

Differences—Collected from Niagara Falls—\$2,486.61

Hydro-Electric Power Commission Balance Sheet for the Period Ending December 31st, 1920

Main Balance Sheet table with columns for Assets, Liabilities, Reserves, and Surplus. Rows for various municipalities and total figures.

Total Assets, Total Liabilities, Reserves and Surpluses, and other summary figures.

MUNICIPALITIES NIAGARA SYSTEM

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